TRICK BOX STUDIOS
www.trickboxstudios.com

Ultimate Adjustable Car Rig for Maya

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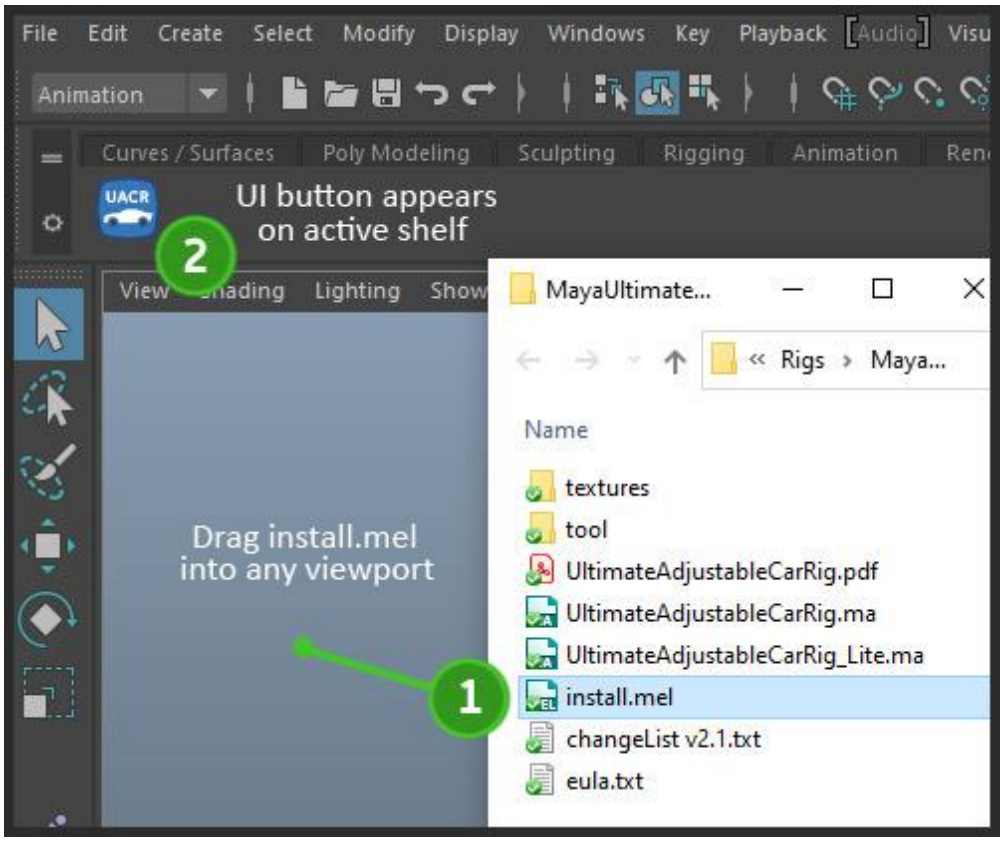
VERSION 2.8

WHAT IS THE ULTIMATE ADJUSTABLE CAR RIG (UAC RIG)?

The Ultimate Adjustable Car Rig is a professional grade, production ready vehicle tool for Autodesk Maya. As well as its unique resizing capability, it boasts a fantastic built in path system, light weight dynamic suspension, in depth steering geometry tuning, tire pressure interaction and a full working chassis model. Users are easily able to resize this rig to fully connect to any 4 - 10 wheeled 3D model in a matter of minutes to achieve stellar animation results without any headaches. [View frequently asked questions]

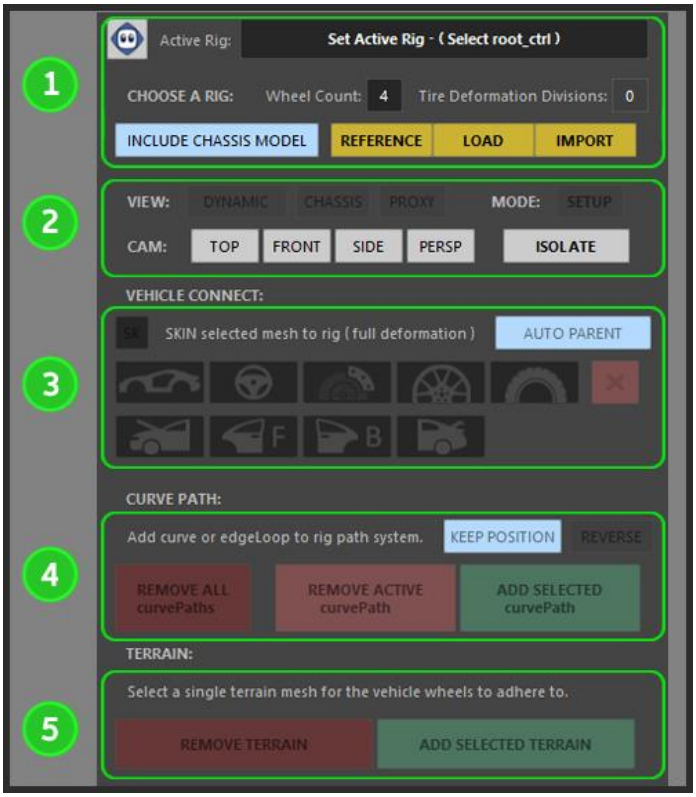
INSTALL

Place the root directory in a nice location on your hard drive. Give it a good home because the tool references this directory. The installation process is painless, just drag the install.mel file into any viewport and you will see an icon appear on your active shelf.



USER INTERFACE

The UI is divided into 5 sections:



1	LOADER	Reference, Load or Import rig from various options.
2	DISPLAY	Quick buttons to change what rig parts are seen and what camera is used to see them.
3	CONNECT	Connects your mesh to the rig using 3 methods: Skin, Constraint or Parent.
4	CURVE PATH	Add and remove custom curve paths.
5	TERRAIN	Connect/Disconnect wheels to a terrain.

1 - LOADER

Help Button

This button will take you to the UACR Online help videos via the Trickbox website.

Active Rig Button

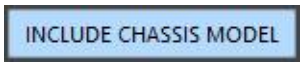
This button will let you know which vehicle the UI is currently linked to. If you have 1 vehicle in the scene this will automatically update. Multiple vehicles will require you to select a control or top node of the car you wish to modify and hit this button to connect it. The name of your connected rig will show up inside the button.

Reference/Load/Import Buttons

The UI is partially disabled until you Reference, Load or Import the rig with any of these yellow buttons. The rig loaded will be determined based on the remaining loader options listed below.

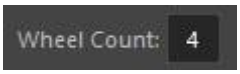
Include Chassis Model Button

This includes the detailed chassis model and all of the additional joints required to move the wishbone and spring geometry. The chassis model is not currently available for 6–10 wheel options.



Wheel Count Button

Indicates how many wheels to load. Default is 4 but clicking the number sets the wheels to 6, 8 or 10.



Tire Deformation Divisions Button

Tire Deformation Divisions change the quality of tire deformation from 0, 20, 48 or 72. 0 is no deformation. Joint counts are listed below in this table:

	TireDiv 0	TireDiv 20	TireDiv 48	TireDiv 72
4 Wheels	33	193	417	609
4 wheels + Chassis	175	335	559	751
6 wheels	45	285	621	909
8 wheels	57	377	825	1209
10 wheels	69	469	1029	1509

2 - DISPLAY ROW

Dynamic Button

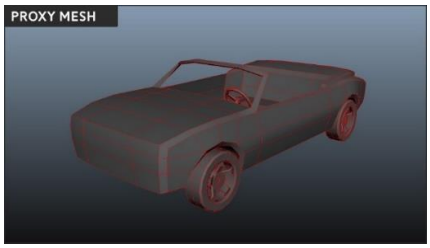
Toggles the visibility of the dynamic control. This can also be done using the Dynamic attribute listed on the body control.

Chassis Button

Toggles the UAC rig demo chassis model. If you want to hide parts of the model you can find the mesh pieces inside in the outliner hierarchy here: “TopNode/Geometry/Render/Chassis”

Proxy Button

Toggles a light weight display mesh that will allow you to animate in the viewport with a much higher frame rate. This mesh is not connected to tire deformation to increase performance.



Mode: Setup/Animate Button

Toggles the UAC Rigs two modes: Setup and Animate. In setup mode, resize controls are displayed to fit the rig to your vehicle. In Animation mode the resize controls are hidden and the animation controls become active. This button connects directly to the "**Control Type**" attribute found on the "**root_ctrl**". It can be toggled at any time.

Camera Shortcut Buttons

These buttons will set the active viewport camera to the labeled camera. They are here because they significantly speed up the resizing process.

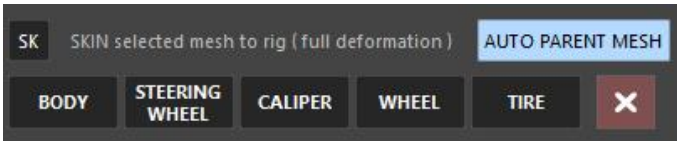
Isolate Button

Isolates the selected object by hiding all other objects in the viewport. Pressing this again will restore the hidden objects. This is very useful for snapping the wheel resize controls to a center vertex on a wheel.

3 - CONNECTION ROW

Connection Mode Button

This button will cycle through the 3 mesh connection modes. When you toggle a different mode, the entire row will change. The 3 connection modes are Skin, Constraint and Parent.



Skin Connection Mode

Binds mesh to a skeleton so it can deform. If you intend to export your final animation as an FBX file, use this mode for every piece. This mode can significantly hurt viewport performance with a heavy mesh. Subdividing your mesh is not recommended until after you connect.

Constraint Connection Mode

Constrains the mesh to the rig. If you intend to export your final animation as an alembic cache, use this mode for all except the tires. Tires will need to use skin mode if you want deformation.

Parent Connection Mode

Parents the mesh to the rig. If you intend to keep your final animation within Maya use this mode for all except the tires. Tires will need to use skin mode if you want deformation.

Body Button
Connects selected mesh or group of mesh to the body component of the rig using the active connection mode.

Steering Wheel Button
Connects selected mesh or group of mesh to the steering rig component using the active connection mode. This component rotates when the car steers.

Caliper Button
Connects selected mesh or group of mesh to the wheel rig component using the active connection mode. Mesh will move with the wheels but will not spin with them.

Wheel Button
Connects selected mesh or group of mesh to the wheel rig component using the active connection mode. This component will rotate when the vehicle drives. Connect your brake disks and rims here. Connect tires if you do not wish for them to deform.

Tire Button
Connects selected mesh or group of mesh to the tire rig component using the active connection mode. This component is the only one that deforms therefore you can only connect the tires using the skin method if you want your tires to deform. Connect to the Wheel component if you do not want them to deform.

Bonnet (Hood) Button
Connects selected mesh or group of mesh to the Bonnet or Hood component using the active connection mode. This component is fixed to the body. If your Bonnet/Hood is not a seperate mesh, you can just use the body button instead.

Front Door Button
Connects selected mesh or group of mesh to the front door component using the active connection mode. This component is fixed to the body. If your front door is not a seperate mesh, you can just use the body button instead.

Back Door Button
Connects selected mesh or group of mesh to the back door component using the active connection mode. This component is fixed to the body. If your back door is not a seperate mesh, you can just use the body button instead.

Boot (Trunk) Button
Connects selected mesh or group of mesh to the Boot or Trunk component using the active connection mode. This component is fixed to the body. If your Boot/Trunk is not a seperate mesh, you can just use the body button instead.

Remove Button
This will disconnect any mesh regardless of what mode is currently active.

Auto parent mesh
When active, any connection method will automatically parent the mesh into the rig hierarchy. Disabling this will keep the mesh out of the rig hierarchy. It is on by default.

4 - CURVE PATH ROW

The Curve Path Row works in conjunction with the "**root_ctrl.CurvePath**" dropdown attribute. Once a curve is added it will behave like all other preset curves. You will be able to scale and mirror the curve using the "**root_ctrl.CurveScale"** and **""root_ctrl.CurveMirror**" attributes.

Keep Position Button

If this button is active, the vehicle root will move to the location of the first point in your new curve. I recommend keeping this turned on in most cases. Turning it off will do the opposite and move the curve to the car. Turning it off is useful when your vehicle is in the center of the world and you are populating your curve list with curves that are not environment specific such as the preset curves that are included with the rig.

Reverse Button

If this button is active, the vehicle will use the other end of the curve as a start point. If you add a curve that is not flowing it the right direction, simply remove it and use this button when adding it again.

Add Selected Path Button

Create a curve or select an edge-loop and hit this button to add the curve it to the "**root_ctrl.CurvePath**" dropdown attribute. I recommend giving a descriptive name to the curve or the source mesh because that is what appears in the dropdown. Once added, the curve is now be part of the rig and functions like the preset curves. This button works with the Keep Position and Reverse Buttons. Note: When you add a curve, a hidden duplicate is made to preserve the curve in case of an error.

Remove Active Path Button

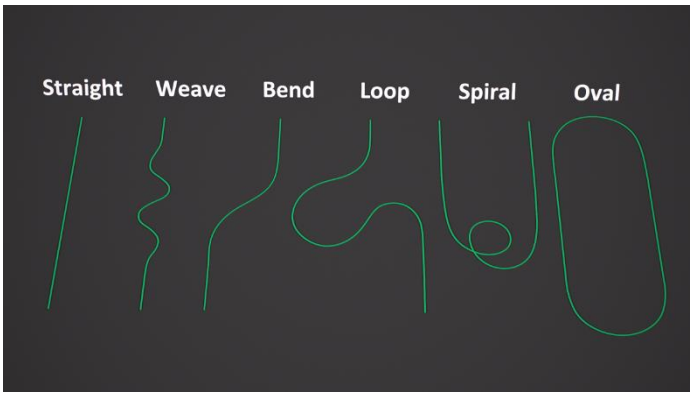
This button will remove the active curve on the "**root_ctrl.CurvePath**" dropdown attribute. If the attribute is set to None or a preset curve, nothing will happen.

Remove All Paths Button

Applies the Remove Active Path function to all user curves. A confirmation prompt will pop up to eliminate any loss from an accidental button press.

Preset Curve Paths

All presets located on the "**root_ctrl.CurvePath**" dropdown attribute. These preset curves cannot be removed from the rig.



5 - TERRAIN

The Terrain Row simply connects or disconnects all wheels of the active vehicle to the selected terrain Mesh. Connected wheels will conform to the mesh surface.

Add Selected Terrain Button

Connects all wheels on the active vehicle to the selected terrain. Each wheel has a tiny plane at the base of each wheel that is built into the rig. These planes are then wrapped to the surface of your terrain mesh using the Maya Muscle system. The wheels are then geometry constraint to these tiny planes to allow the suspension to interact with the terrain. Geometry constraints have a habit of sliding around but when used this way they are very efficient and will not slide.

Remove Terrain Button

This will remove all wheel connections from every vehicle attached to the selected terrain.

Terrain usage tips:

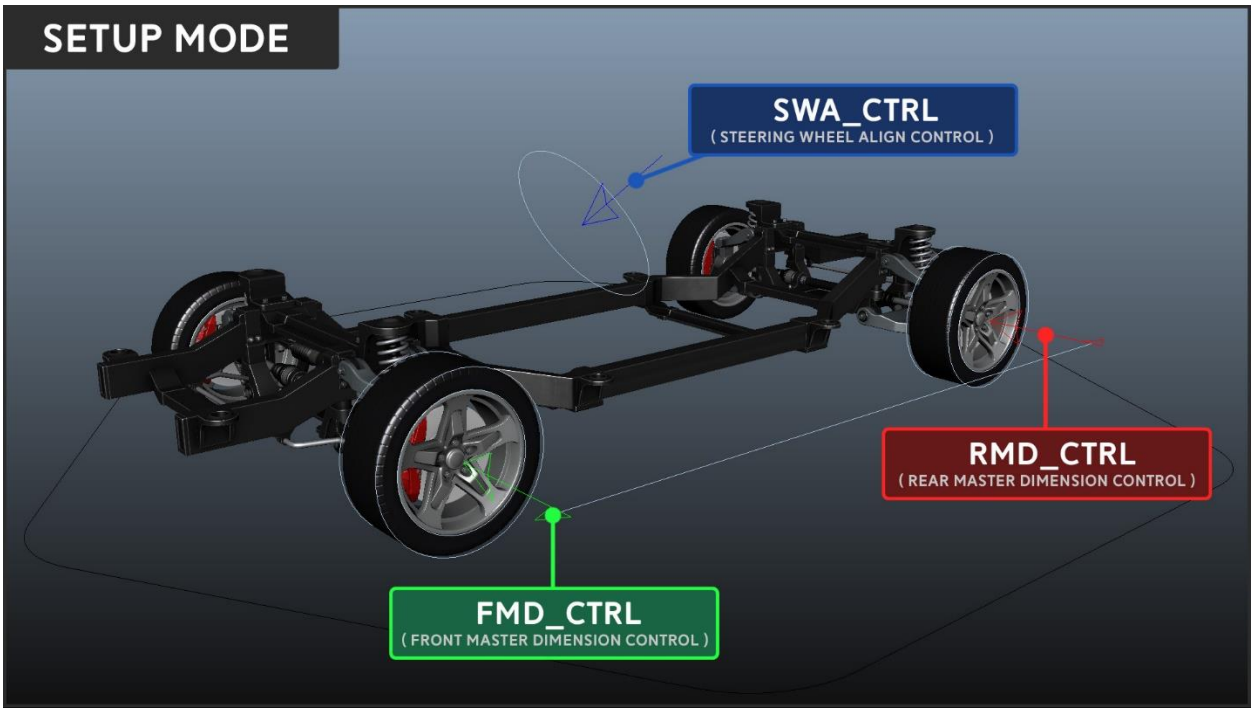
- If you know the area of the mesh you will be driving on, make a duplicate and trim it down to reduce to poly count as much as you can. Connect to the duplicate for better performance. Smoothing the duplicate with the “Average Vertices” tool will also reduce the amount of motion abruptness on a bumpy terrain mesh.

- Animate your car using a curve path before you connect to the terrain. The curve should follow the larger forms of the terrain and once you connect, the wheels will follow to the smaller forms.

- You can control the deformation with terrain link attributes located on each of the wheel controls.

- On the wheel controls there are “Chassis Influence” attributes. The “From Wheel Ctrl” will be very useful in modifying the body movement, especially when the wheels are moving on bumpy terrain.

CONTROL OVERVIEW



fmd_ctrl

Transforms	Move this control to the center point of your left front wheel.
Tire Width	Adjusts the width of the front tire. For best results, try to set the display ring slightly outside of your mesh using the front camera shortcut.
Tire Side Wall	Adjusts the thickness of the front tire. For best results, try to set the display ring slightly outside of the wheel rim.
Knuckle Offset	Adjusts the distance between the front wheel and the steering knuckle (spindle length) The wheel rotation calculations when steering will also be modified.

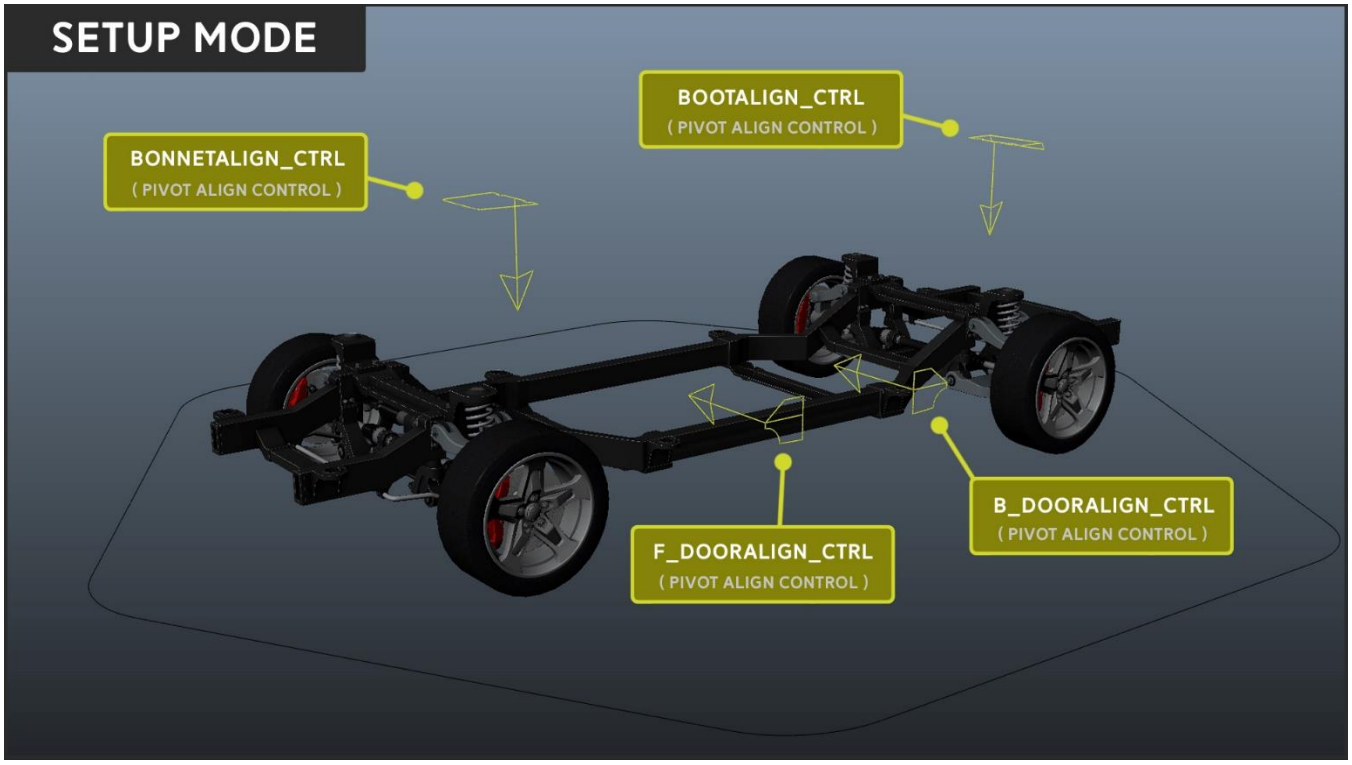
rmd_ctrl (When using more than 4 wheels, similar controls will appear.)

Transforms	Move this control to the center point of your left rear wheel.
Tire Width	Adjusts the width of the rear tire. For best results, try to set the display ring slightly outside of your mesh using the front camera shortcut.
Tire Side Wall	Adjusts the thickness of the rear tire. For best results, try to set the display ring slightly outside of the wheel rim.
Knuckle Offset	Adjusts the distance between the rear wheel and the steering knuckle (spindle length) The wheel rotation calculations when steering will also be modified.

swa_ctrl

Transforms	Move and tilt this control to align the steering wheel. Use the side view when tilting.

Under the root control you can enable a few more optional setup controls:



f_doorAlign_ctrl

Transforms	Move and rotate this control to align the front door pivot point. Traditional and gullwing doors will work.

b_doorAlign_ctrl

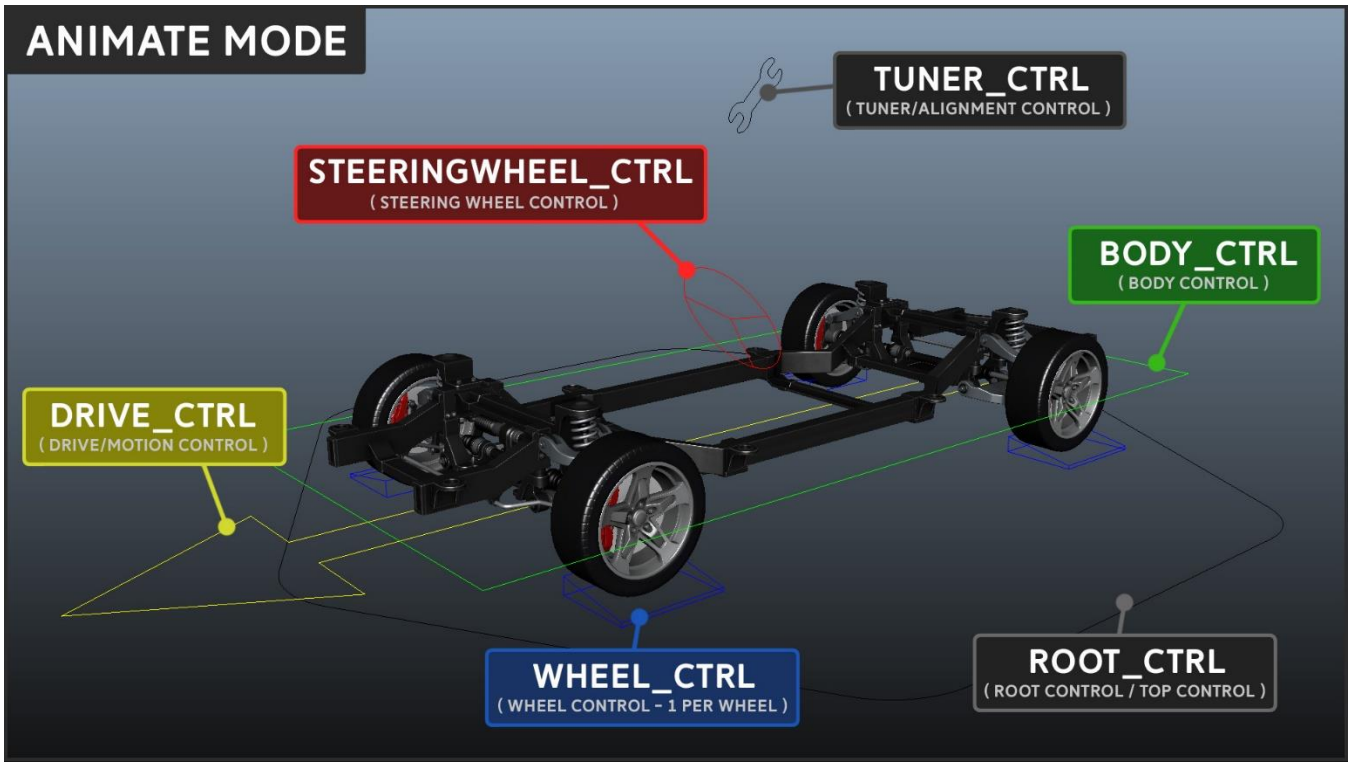
Transforms	Move and rotate this control to align the back/rear door pivot point.

bonnetAlign_ctrl

Transforms	Move and rotate this control to align the bonnet/hood pivot point.

bootAlign_ctrl

Transforms	Move and rotate this control to align the boot/trunk pivot point.



root_ctrl

Transforms	Limited to Translate X, Y & Z. Translate Z is the only functional transform. X and Y are left open for a possible geometry constraint connection.
ControlScale	Scales the display shape of the curve control.
GlobalScale	Scales the entire vehicle (does not scale the curve path system)
CURVE PATH	
CurvePath	Dropdown menu of all preset and user curve paths. Set to None to disable Path.
CurveScale	Scales the entire curve path system.
CurveMirror	Mirror the active curve path.
DISPLAY	
ControlType	Toggles between setup and animation controls. The UI “Setup” button sets this.
ShowProxy	Toggles between the proxy and render groups. The UI “Proxy” button sets this.
ShowChassis	Toggles the visibility of the chassis model. The UI “Chassis” button sets this.
ShowCurvePath	Toggles the visibility of the active curve path.
ShowTuner	Toggles the visibility of tuner_ctrl.
ShowSteeringWheel	Toggles the visibility of both steeringWheel_ctrl and swa_ctrl.
ShowFrontDoors	Toggles visibility of leftfrontDoor_ctrl, rightfrontDoor_ctrl and f_doorAlign_ctrl.
ShowRearDoors	Toggles visibility of leftRearDoor_ctrl, rightRearDoor_ctrl and b_doorAlign_ctrl.
ShowBonnet	Toggles the visibility of both bonnet_ctrl and bonnetAlign_ctrl.
ShowBoot	Toggles the visibility of both boot_ctrl and bootAlign_ctrl.

steeringWheel_ctrl

Transforms	Limited to Rotate Z. This rotation can also initiate steering.
ControlScale	Scales the display shape of the curve control.
SteeringWheelRatio	The multiplier ratio of the connection between steering and steering wheel.

body_ctrl

Transforms	Limited to Translate X, Rotate X and Rotate Z
ControlScale	Scales the display shape of the curve control.
DYNAMIC	
Dynamic	Toggles body dynamics. See dynamic control below.
NOISE	
UpDownNoise	Generates ambient Translate Y motion.
FwdTiltNoise	Generates ambient Rotate X motion.
SideTiltNoise	Generates ambient Rotate Z motion.
NoiseSpeed	Changes the speed of the ambient motion generated for the Noise attributes.
NoiseOffset	Offsets the ambient motion curves on the noise attributes.
SHAKE	
UpDownAmount	Generates wave motion on Translate Y
FwdTiltAmount	Generates wave motion on Rotate X
SideTiltAmount	Generates wave motion on Rotate Z
UpDownSpeed	Changes the frequency of the Translate Y wave motion
FwdTiltSpeed	Changes the frequency of the Rotate X wave motion
SideTiltSpeed	Changes the frequency of the Rotate Z wave motion
UpDownSpeed	Changes the frequency of the Translate Y wave motion
FwdTiltSpeed	Changes the frequency of the Rotate X wave motion
SideTiltSpeed	Changes the frequency of the Rotate Z wave motion
WHEEL INFLUENCE	
ToTirePressure	Adjusts how much the tires react from all sources of body motion.
ToCamber	Adjusts how much the camber reacts from all sources of body motion.

wheel_ctrl (all 4 - 10 wheels contain the same attributes)

Transforms	Limited to Translate X, Y & Z. Translate Y is the only functional transform.
ControlScale	Scales the display shape of the curve control.
ADJUST	
TirePressure	Simulates the air in a tire. This attribute impacts the entire rig. It is possible to drive the car with 4 flat tires. (Not available in Lite Rig)
TireBulge	Adjusts the extruding base of the tire contact point.
Spin	Spins the wheel independently from any other drive source.
DriveSpinMultiplier	Multiplies the wheel spin from all drive sources. Can simulate a slippery road.
ALIGNMENT	
Camber	Animatable camber that impacts the body and tires.
Toe	Animatable Toe (Rotate Y)
Fly	Tilts wheel to face the ground. (Back to the future style).
CHASSIS INFLUENCE	
FromTirePressure	Adjusts how much the chassis reacts from tire deformation.
FromWheelCtrl	Adjusts how much the chassis reacts from lifting the wheel_ctrl.
FromCamber	Adjusts how much the chassis reacts from camber changes.
TERRAIN	
TerrainLink	If a terrain connection has been made, this attribute blends the terrain link influence for the given wheel. To blend all wheels at once you can use the same attribute on the drive_ctrl.

drive_ctrl

Transforms	All Translation and Rotation available. Translate Z activates wheels.
ControlScale	Scales the display shape of the curve control.
DRIVE	
Steer	Steers the vehicle
OverSteer	Causes the rear of the car to sway sideways at the front axis pivot point. Steering traction can be adjusted with the OverSteerTraction attribute below.
UnderSteer	Causes the front of the car to sway sideways at the rear axis pivot point. Steering traction can be adjusted with the UnderSteerTraction attribute below.
FwdTip	Tips the car forward or backward onto two wheels.
SideTip	Tips the car side to side onto two wheels.
FrontWheelSpin	Spins the front wheels independently from and other drive source.
RearWheelSpin	Spins the rear wheels independently from and other drive source.
Fly	Tilts all wheels to face the ground. (Back to the future style).
CURVEPATH	
PathDrive	Drives the car along the active paerth. 0-100 is the range of this attribute. The value represents the % of the path traveled. This also activates the wheels.
PathSpin	Spins the car around the path on the Z axis.
AutoSteer	Influence from an auto steer prediction point moving in front of the car.
AutoSteerDst	The distance the steer prediction point is from the car.
ADJUST	
OverSteerTraction	The amount of steer traction while the OverSteer attribute is being used.
UnderSteerTraction	The amount of steer traction while the UnderSteer attribute is being used.
TERRAIN	
TerrainLink	If a terrain connection has been made, this attribute blends the terrain link influence for the all wheels. To blend a specific wheels influence, you can use the same attribute located on its wheel_ctrl.

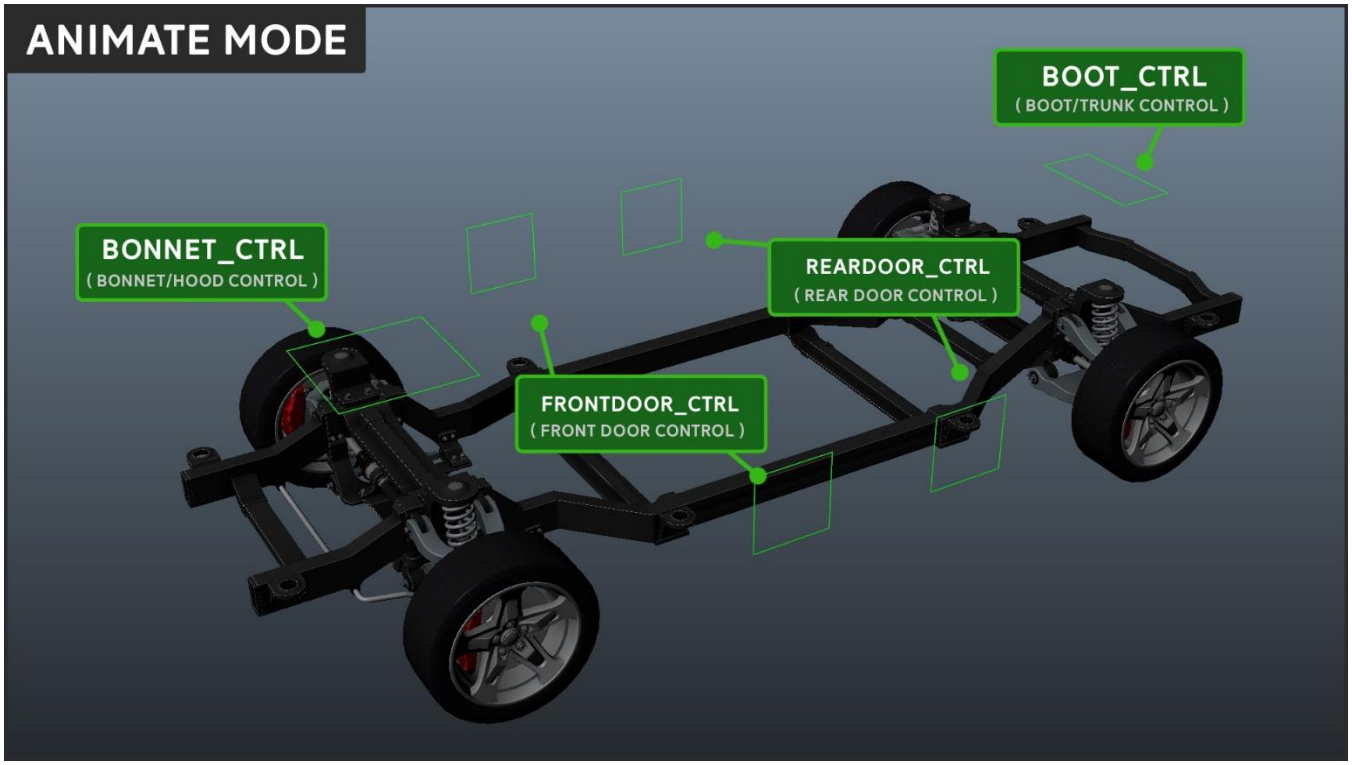
dynamic_ctrl

Transforms	Position only. Used to separate 2 goal particles. One attached to the dynamic control, one to the car body. Moving it causes a spring like motion on playback. **Non-curve path** animations will require some manual keyframes on this attribute in order to initialize the goal particles. **Curve path** animations link the dynamic control to the the root control which results in active dynamic response when driving. Note: If you start your animation away from the root control (non-zero drive value), you will need to manually blend your influences or sensitivity attributes from 0 to you desired value to reduce or stop any initial pop that occurs.
Start Frame	The frame that the dynamic system becomes active
Sensitivity	0 – 1 range. Higher values increase the time it takes to return to rest point.
UpDownInf	Adjusts how much up and down motion to transfer to the body.
FwdTiltInf	Adjusts how much forward tilt motion to transfer to the body.
SideTiltInf	Adjusts how much side tilt motion to transfer to the body.

tuner_ctrl

ALIGNMENT	
ControlScale	Scales the display shape of the curve control.
AckermannInf	Blends between parallel and Ackermann steering. A value of 1 means 100% Ackermann, 0 means the steering is 100% parallel.
Caster	Adjusts the caster angle of the front knuckles. This creates a realistic tilt in the steering that compresses the tires. (Tire compression not available in Lite Rig)
FrontCamber	Adjusts the front wheel camber. This attribute is used to initially setup your vehicle with camber. The camber listed on the individual wheels is for animating.
RearCamber	Adjusts the rear wheel camber. This attribute is used to initially setup your vehicle with camber. The camber listed on the individual wheels is for animating.
FrontToe	Tilts the front wheels on the Y axis.
RearToe	Tilts the rear wheels on the Y axis.
RideHeightOffset	Adjusts the height of your attached body model.

Under the root control you can enable more optional animation controls:



door_ctrl (all 4 doors contain the same attributes)

Transforms	All Translation and Rotation available. Traditional and Gullwing doors will work.
ControlScale	Scales the display shape of the curve control.

bonnet_ctrl & boot_ctrl (contain the same attributes)

Transforms	All Translation and Rotation available.
ControlScale	Scales the display shape of the curve control.